2. An ultrasonic diagnostic imaging system for producing a blended harmonic ultrasonic image of tissue inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals from tissue at a plurality of depths in the body;

means for separating said echo signals into fundamental and harmonic frequency components; and

an image processor which produces image signals which are a blend of proportions of said fundamental and harmonic frequency components, said proportions varying with echo signal depth,

wherein said image processor comprises means for producing image signals of predominately harmonic frequency components in the near field of an image, and image signals of predominately fundamental frequency components in the far field of an image.

3. The ultrasonic diagnostic imaging system of Claim 2, wherein said image processor further comprises means for producing image signals of both harmonic and fundamental frequency components in the intermediate field between said near and far fields.

4. The ultrasonic diagnostic imaging system of Claim 1, wherein said separating means includes a filter for producing fundamental frequency echo signal components to the at least partial exclusion of harmonic frequency components, and for producing harmonic frequency echo signal components to the at least partial exclusion of fundamental frequency components.

5. An ultrasonic diagnostic imaging system for producing a blended harmonic ultrasonic image of tissue inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals from tissue at a plurality of depths in the body;

means for separating said echo signals into fundamental and harmonic frequency components; and

an image processor which produces image signals which

are a blend of proportions of said fundamental and harmonic frequency components, said proportions varying with echo signal depth,

wherein said separating means includes a filter for producing fundamental frequency echo signal components to the at least partial exclusion of harmonic frequency components, and for producing harmonic frequency echo signal components to the at least partial exclusion of fundamental frequency components,

wherein said transmitting means comprises means for transmitting two differently phased pulses of ultrasonic energy to a common region of the body, and

wherein said filter combines ultrasonic echoes from said two transmitted waves to produce at least one of said fundamental and harmonic frequency echo components.

6. An ultrasonic diagnostic imaging system for producing a blended harmonic ultrasonic image of tissue inside a body, comprising:

means for transmitting ultrasonic energy into the body at a fundamental frequency;

means, responsive to said transmitted ultrasonic energy, for receiving ultrasonic echo signals from tissue at a plurality of depths in the body;

means for separating said echo signals into fundamental and harmonic frequency components; and

an image processor which produces image signals which are a blend of proportions of said fundamental and harmonic frequency components, said proportions varying with echo signal depth,

wherein said image processor comprises means for producing a fundamental image from said fundamental frequency components and a harmonic image from said harmonic frequency components,

wherein said image processor produces a blended image which is a combination of image signals from said fundamental and harmonic images.

7. An ultrasonic diagnostic imaging system for producing a blended harmonic ultrasonic image of tissue inside a body, comprising:

a transducer for receiving ultrasonic echoes from tissue in an image area of the body in the absence of an ultrasonic contrast agent, said ultrasonic echoes containing fundamental and harmonic frequency components; and

an image processor, responsive to said ultrasonic echoes, for producing an image of said image area which is a variable blend of fundamental and harmonic frequency information.

8. The ultrasonic diagnostic imaging system of Claim 7, wherein said image contains a first image area region formed principally from harmonic frequency components and a second image area region formed principally from fundamental frequency components.

9. The ultrasonic diagnostic imaging system of Claim 8, wherein said first image area is in the near field of said image and said second image area is in the far field of said image.

10. The ultrasonic diagnostic imaging system of Claim 9, further comprising a third image area formed from a blend of both fundamental and harmonic frequency components.

11. The ultrasonic diagnostic imaging system of Claim 7, wherein said blend is a function of the depth from which said ultrasonic echoes are received.

12. The ultrasonic diagnostic imaging system of Claim 7, wherein said blend is a function of the location in said image area from which said ultrasonic echoes are received.

13. A method for producing an ultrasonic image which is a blend of fundamental and harmonic frequency echo information comprising the steps of:

receiving ultrasonic echoes from tissue of the body in the absence of an ultrasonic contrast agent which contain both fundamental and harmonic frequency components;

separately detecting said fundamental and harmonic frequency components of said ultrasonic echoes;

forming signals which are a blend of said detected fundamental and harmonic frequency components prior to image formation;

storing said signals in a blended image memory; and

displaying an image from the signals stored in said blended image memory.

14. The method of Claim 13, wherein said blend of fundamental and harmonic frequency components varies as a function of time.

15. The method of Claim 13, wherein said blend of fundamental and harmonic frequency components varies as a function of depth.

16. The method of Claim 13, wherein said blend of fundamental and harmonic frequency components varies as a function of the location of said tissue.

17. An ultrasonic diagnostic imaging system for producing a blended harmonic ultrasonic image of tissue inside a body, comprising:

a transducer for receiving ultrasonic echoes from tissue in an image area of the body, said ultrasonic echoes containing fundamental and harmonic frequency components;

a time varying filter, responsive to said received ultrasonic echoes, for producing signals containing different proportions of fundamental and harmonic frequency echo components at different times; and

an image processor, responsive to said signals produced by said time varying filter, for producing an image which is a blend of fundamental and harmonic frequency information.

18. The ultrasonic diagnostic imaging system of Claim 17, wherein said time varying filter exhibits a passband which varies from high to low frequencies over time.

19. The ultrasonic diagnostic imaging system of Claim 18, wherein said time varying filter produces signals containing a relatively high proportion of harmonic frequency components from echoes received at shallow depths, and a relatively high proportion of fundamental frequency components from echoes received at deeper depths.

20. The ultrasonic diagnostic imaging system of Claim 17, wherein said time varying filter comprises a digital filter.

21. The ultrasonic diagnostic imaging system of Claim 20, wherein the passband of said digital time varying filter is changed by changing the filter coefficients with time.

22. An ultrasonic diagnostic imaging system for producing a harmonic ultrasonic image of tissue inside a body, comprising:

a transducer for receiving ultrasonic echoes from tissue in an image area of the body, said ultrasonic echoes containing fundamental and harmonic frequency components;

a processing channel, and responsive to said received ultrasonic echoes, which alternately produces fundamental and harmonic frequency signals in a time interleaved fashion; and

an image processor, responsive to said time interleaved signals, which produces an ultrasonic image containing both fundamental and harmonic frequency signal information.

23. The ultrasonic diagnostic imaging system of Claim 22, wherein said processing channel further comprises a digital filter.

24. The ultrasonic diagnostic imaging system of Claim 23, wherein said digital filter alternately exhibits two different passbands.

25. The ultrasonic diagnostic imaging system of Claim 24, wherein said digital filter alternately exhibits a high frequency passband which produces harmonic frequency signal components, and a low frequency passband which produces fundamental frequency signal components.

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26. A method for producing an ultrasonic image which is a blend of fundamental and harmonic frequency echo information comprising the steps of:

receiving from a range of depths a sequence of ultrasonic echoes from tissue of the body which contain both fundamental and harmonic frequency components;

separating said fundamental and harmonic frequency components of said ultrasonic echoes;

forming signals corresponding to said range of depths which are a varying composition of said fundamental and harmonic frequency components with depth; and

displaying an image produced from said signals.

27. A method for producing an ultrasonic image which is a blend of fundamental and harmonic frequency echo information comprising the steps of:

receiving from a range of depths a sequence of ultrasonic echoes from tissue of the body which contain both fundamental and harmonic frequency components;

separating said fundamental and harmonic frequency components of said ultrasonic echoes;

forming signals corresponding to said range of depths which are a varying composition of said fundamental and harmonic frequency components; and

displaying an image produced from said signals,

wherein said step of forming forms signals primarily composed of harmonic frequency information at a shallow depth,

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and forms signals primarily composed of fundamental frequency information at a deeper depth.

28. An ultrasonic imaging method comprising:

transmitting ultrasonic energy to a target, said ultrasonic energy characterized by a peak power level in a fundamental frequency band;

receiving ultrasonic echo information associated with said transmitted ultrasonic energy in first and second frequency bands, said first frequency band comprising said fundamental frequency band, said second frequency band comprising a harmonic of said fundamental frequency band and substantially excluding said fundamental frequency band;

forming a composite image in response to said received ultrasonic echo information, said composite image comprising spatially distinct near-field and far-field regions, said far-field region emphasizing echo information in the first frequency band and said near-field region emphasizing echo information in the second band.

29. An ultrasonic imaging method comprising the following steps:

(a) acquiring fundamental mode ultrasonic image signals and harmonic mode ultrasonic image signals from a scanned region with a transducer;

(b) combining the fundamental and harmonic mode image signals of step (a) to form a composite image, said composite image comprising a first predetermined image region that is modulated primarily as a function of the fundamental mode ultrasonic image signals and a second predetermined image region that is modulated primarily as a function of the harmonic mode ultrasonic image signals.

30. The ultrasonic imaging method of Claim 29, wherein acquiring harmonic mode ultrasonic image signals is performed in the absence of an ultrasonic contrast agent in the scanned region.

31. A medical ultrasonic diagnostic composite image comprising:

a first predetermined image region modulated primarily as a function of fundamental mode ultrasonic image signals acquired from a portion of a subject;

a second predetermined image region modulated primarily as a function of harmonic mode ultrasonic image signals acquired from a portion of the subject.

32. The medical ultrasonic diagnostic composite image of Claim 31, wherein the harmonic mode ultrasonic image signals are acquired in the absence of an ultrasonic contrast agent.

33. An ultrasonic imaging system comprising:

means for acquiring fundamental mode ultrasonic image signals and harmonic mode ultrasonic image signals from a scanned region with a transducer;

means for combining the fundamental and harmonic mode image signals to form a composite image, said composite image comprising a first predetermined image region that is modulated primarily as a function of the fundamental mode ultrasonic image signals and a second predetermined image region that is modulated primarily as a function of the harmonic mode ultrasonic image signals.

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34. The ultrasonic imaging system of Claim 33, wherein the means for acquiring acquires the harmonic mode ultrasonic image signals in the absence of an ultrasonic contrast agent in the scanned region.

35. An ultrasonic imaging method comprising the following steps:

(a) acquiring fundamental mode ultrasonic image signals and harmonic mode ultrasonic image signals with a transducer;

(b) combining the fundamental and harmonic mode image signals of step (a) to form a composite image, said composite image comprising a first image region that is modulated primarily as a function of the fundamental mode ultrasonic image signals, a second image region that is modulated primarily as a function of the harmonic mode ultrasonic image signals, and a compound image region that is modulated as a function of both the fundamental mode image signals and the harmonic mode image signals, the compound region being intermediate of the first and second image regions.

36. The ultrasonic imaging method of Claim 35, wherein the step of acquiring further comprises acquiring harmonic mode ultrasonic image signals in the absence of an ultrasonic contrast agent.

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37. A medical ultrasonic diagnostic imaging system adapted to provide a composite image comprising:

a first image region modulated primarily as a function of fundamental mode ultrasonic image signals;

a second image region modulated primarily as a function of harmonic mode ultrasonic image signals; and

a compounded region, intermediate the first and second image regions, said compounded region modulated as a function of both the fundamental mode image signals and the harmonic mode image signals.

38. The medical ultrasonic diagnostic imaging system of Claim 37, wherein the harmonic mode ultrasonic image signals are acquired in the absence of an ultrasonic contrast agent.

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39. An ultrasonic imaging method comprising the following steps:

(a) acquiring fundamental mode ultrasonic image signals and harmonic mode ultrasonic image signals with a transducer in the absence of an ultrasonic contrast agent;

(b) combining the fundamental and harmonic mode image signals of step (a) to form a composite image, said composite image comprising a first image region that is modulated as a function of the fundamental mode ultrasonic image signals and a second image region that is modulated primarily as a function of the harmonic mode ultrasonic image signals.

40. A medical ultrasonic diagnostic imaging system adapted to provide a composite image of a subject comprising:

a first image region modulated primarily as a function of fundamental mode ultrasonic image signals acquired from a first region of the subject; and

a second image region modulated primarily as a function of harmonic mode ultrasonic image signals acquired from a second region of the subject in the absence of an ultrasonic contrast agent.

41. An ultrasonic imaging system comprising:

means for acquiring fundamental mode ultrasonic image signals and harmonic mode ultrasonic image signals with a transducer in the absence of an ultrasonic contrast agent;

means for combining the fundamental and harmonic mode image signals to form a composite image, said composite

image comprising a first image region that is modulated primarily as a function of the fundamental mode ultrasonic image signals and a second image region that is modulated primarily as a function of the harmonic mode ultrasonic image signals.

Respectfully submitted,

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